National Climate Assessment
Scenario Planning Opportunity for Regions and Sectors[1]

This document summarizes an opportunity to help stakeholders assess potential adaptation options that could reduce risk to critical resources, economic, environmental and social systems, and quality of life. The opportunity starts with stakeholder engagement and uses science-based scenarios to provide information on the potential extent and timing of future socioeconomic, environmental, and climate conditions to test adaptation strategy robustness. The document describes this ***optional, experimental scenario planning activity***. It provides background on what scenarios are, who might consider participating in the exercise, and what would be required. More information is available through William Emanuel at the NCA office (wemanuel@usgcrp.gov).

I. Background

If past is prologue, the United States should look forward to large and even unexpected changes in regional settlement patterns, transportation systems, communications, public health threats and technology, levels of wealth, consumption patterns, international relationships, and environmental conditions including climate. Collectively, these changes will affect quality of life, ecosystem health and the viability of different investment and management decisions. Stakeholders around the nation will need to consider how to adapt their plans aspirations to these evolving conditions to develop resilient communities and systems.

What are scenarios?

Government institutions (national to local), corporations, military planners, NGOs, researchers, and others use scenarios to envision possible future states of the world and their potential impact on decisions that they will need to take before uncertainties can be resolved. Scenarios are depictions of uncertain aspects of the future that challenge assumptions, encourage strategic thinking, and foster insight into managing change and planning in the face of uncertainty.

How are scenarios used?

In climate change assessments such as the National Climate Assessment (NCA), science-based scenarios of future potential levels of climate change are used in assessing impacts and planning adaptation options. Typically these scenarios are quantitative in nature, and they are often used to provide input assumptions to a variety of impacts models. For this round of the NCA, two widely available sets of scenarios have been selected to underpin the assessment, one (the "B1" scenario) depicting relatively modest climate change, and the other (the "A2" scenario) describing high levels of climate change (see below).

[1] This document was drafted by Holly Hartman, Kathy Jacobs, and Richard Moss, drawing on inputs from several scenario planning activities.

Scenarios as engagement tools…

There is growing experience with integrating these sorts of scientifically-based scenarios into scenario planning activities in which a mix of stakeholders and experts engage in a shared assessment process. To grossly simplify the roles of these groups in scenario planning, experts bring specialized knowledge based on research, and stakeholders identify goals and evaluate the consequences of different options for their objectives. ***The NCA is encouraging regional and sectoral teams to conduct trial scenario planning exercises focused on adaptation needs***. The idea is to work with a sub-group within your sectoral or regional assessment to facilitate their exploration of how climate and other socioeconomic and environmental changes could affect their aspirations and plans, and to consider what adaptations would be effective under different levels of change. The intent is to encourage use of this emerging approach for engaging stakeholders, to develop inputs for the 2013 assessment, and to examine whether the methodology holds promise for more widespread use in future assessments.

Requests to those providing inputs to the NCA and to authors of assessment report chapters:
1. Inventory ongoing scenario planning activities: identify and describe groups in your region or area of interest using scenario planning and report these in your submission to the NCA.
2. Incorporate results of ongoing scenario planning activities into your reports or chapters: these activities provide insights on challenges or opportunities for adaptation within and across regions and sectors, perspectives on uncertainty, tolerance to risk, and willingness to consider novel futures or adaptation options.
3. Undertake a pilot scenario planning activity: work with stakeholders and use a familiar scenario method to conduct the adaptation planning activity described in this document.

The rest of this document provides an overview of the opportunity and available resources to support interested groups.

II. Scenario Planning Pilot Activity

The suggested NCA scenario planning option is to help stakeholders think about adaptation options that reduce risk to critical resources, economic, environmental and social systems, and quality of life. Ideally, all of the following steps would be implemented in an iterative fashion but this is only a suggested approach that can be modified – indeed, there are a number of methods in use and under development, and the NCA is open to all of them. For the NCA 2013, a more limited set of steps could be adopted that excludes quantitative model application and encourages stakeholders to consider acceptable and feasible (politically, institutionally, financially, …) approaches to adapt to the impacts identified above. The scenario planning process can make use of information on key regional or sectoral risks identified through the risk-based framing approach being encouraged in the

assessment.

Recommended steps in this process include:

1. ***Select participants***: Identify a representative group of stakeholders – either focused on a specific sector/issue or including representatives of diverse interests in a region. Candidates might include communities that are contemplating a specific decision that is sensitive to future climate and has a long time horizon.

2. ***Define/refine the issue:*** Have the group define a specific issue, objective, or decision of importance; for example, planning for public water works, county planning for land-use zoning, or regional governors' association development of multi-state water management accord. Alternatively, have a representative sample of interests/stakeholders consider adaptation to a broad range of potential impacts in the region or sector, such as topics identified during risk-based framing conversations such as sea-level rise in coastal areas.

3. ***Analyze potential impacts and prioritize the most important risks***: Using the climate and other environmental changes associated with the SRES B1 and A2 scenarios (if information is available), identify notable risks and/or potential impacts on the objective or decision. Consider system conditions or behaviors, including trends, regimes, thresholds and triggers, discontinuities and cascading effects. This stage of the process integrates science-based scenarios of climate change, socioeconomic conditions, and other environmental factors (e.g., land use). It is desirable to incorporate information from available quantitative and qualitative studies, as well as from different components of your regional or sectoral technical report or assessment. There are a variety of scenario resources that have been prepared for NCA use, notably a set of regional and national climate change trends and outlooks that provide easy to understand information about recent trends and potential future climates under the B1 and A2 scenarios. See below for a more complete description of the scenarios.

4. ***Construct adaptation scenarios***: Develop narratives (and if possible quantitative information) that describe how the group envisions adaptation to these changes could take place. This should include identification of technologies, management practices, financial resources, changes in use, etc., and if possible should integrate these approaches into a narrative that illustrates how the options would be implemented. Consider cases 1 and 4 below, at a minimum. Quantitative models used in resource management decisionmaking can be used with quantitative data from the NCA scenarios to explore the benefits of different adaptation strategies. If possible, use a table like the ones below to record your results for each of the cases considered (the tables below assume consideration of impacts and adaptation in multiple sectors of a region, but a table would also be useful for recording results of a more focused exercise).

5. ***Assess implications for decision-making***: Identify risks, rewards, synergies, and tradeoffs of the adaptation strategies; explore implications of results with stakeholders; and devise plans to monitor and audit scenario plans and resulting management strategies. Finalize descriptions or "narratives" of the future with and without **adaptation** and examine implications for resource management and other decisions.

6. ***Report your results***: present in your assessment chapter or technical input document a description of the adaptation narratives, including options, implementation needs, and likely outcomes. Share with other assessment teams to the extent feasible.

7. ***Document and evaluate the process****:* Please describe the specific process you used and evaluate its effectiveness in enabling participants to think creatively and systematically about potential risks and adaptation strategies. Include suggestions for improvements to the process.

Planning cases based on the A2 and B1 scenarios

If possible, consider at least these two very different possible futures. The first type of future (A2) represents a high level of stress on a region or sector, with limited resources to moderate vulnerabilities or impacts through adaptation. (You might call it "Big Problems, Little Capacity".) This future incorporates science-based scenarios that have assumed the A2 emissions scenario. Based on the narrative description of the underlying logic for this scenario, this future includes relatively high levels of population growth and slower economic development, resulting in a lower level of resources per capita. In addition, there is limited emphasis on environmental concerns, with the result, for example, that urban growth represents a sprawl pattern, with lower spatial density but more extensive intrusion into ecosystems and landscapes and higher extent of impervious surfaces.

The second type of future (B1) represents a very different possibility – that stresses are *relatively* low and there sufficient resources with which to prepare or respond, whether through policy, expenditures, or behavior. (You might call it "The Best Chance You'll Get"). This future is represented by the science-based scenarios produced with forcing from the SRES B1 scenario. Population growth is slower, and emphasis on sustainable economic development results in higher per capita GDP and smaller environmental impact. For example, smart growth has resulted in compact urban areas, less intrusion on ecosystems, and smaller extent of impervious surfaces.

Further information about each of these futures is available in a number of the resources listed below.

III. Cautions

Several cautions to consider:

In a set of quantitative, model-based scenarios, specific combinations of projected conditions are selected *a priori* from among a large set of combinations of model input parameters to span a range of possible futures. In fact, the probability associated with any one future is small since it reflects a combination of point values of key parameters. There is no basis for confidence that any particular scenario set captures the range of possible combinations of climate, environmental, and socioeconomic conditions that should be considered in impacts assessment. Our selection of two possible futures represents a need to limit the request to a manageable set. The two scenarios are meant to bound a reasonable range of future conditions. The tables on the next page should help.

Another concern is that users can develop overconfidence in scenarios, coming to believe that they represent the most important or likely possibilities when in fact their likelihood is quite low. This topic should be discussed with stakeholders if possible as part of the introduction to this exercise.

Resources

[To be added. This list will include the scenarios report from last December, a background document on SRES, links to the Trends and Outlooks documents, downscaling, and SLR scenario, and links to other resources including some example detailed methodologies for scenario planning.]

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203 For case 1: A2 Climate-High Env. Stress-Low Resources

Sector	Potential Impacts	Adaptation Options	Implementation Requirements	Outcome
Agriculture	Changes in crop yields			
	More rapid rotation, potential double cropping			
	Increased risk of heat stress			
	Increased demand for irrigation water			
	Increased risk of pest outbreaks and weeds			
	Increased demand for exports due to crop failures elsewhere			
Water resources	…			
Health	…			
Tourism	…			
…				

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205 For case 4: B1 Climate-Low Env. Stress-High Resources

Sector	Potential Impacts	Adaptation Option	Implementation Requirements	Outcome

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